

CHAPTER 5. USING AND CONFIGURING FIREWALLD

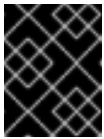
A *firewall* is a way to protect machines from any unwanted traffic from outside. It enables users to control incoming network traffic on host machines by defining a set of *firewall rules*. These rules are used to sort the incoming traffic and either block it or allow through.

Note that **firewalld** with **nftables** backend does not support passing custom **nftables** rules to **firewalld**, using the **--direct** option.

5.1. WHEN TO USE FIREWALLD, NFTABLES, OR IPTABLES

The following is a brief overview in which scenario you should use one of the following utilities:

- **firewalld**: Use the **firewalld** utility for simple firewall use cases. The utility is easy to use and covers the typical use cases for these scenarios.
- **nftables**: Use the **nftables** utility to set up complex and performance critical firewalls, such as for a whole network.
- **iptables**: The **iptables** utility on Red Hat Enterprise Linux 8 uses the **nf_tables** kernel API instead of the **legacy** back end. The **nf_tables** API provides backward compatibility so that scripts that use **iptables** commands still work on Red Hat Enterprise Linux 8. For new firewall scripts, Red Hat recommends to use **nftables**.



IMPORTANT

To avoid that the different firewall services influence each other, run only one of them on a RHEL host, and disable the other services.

5.2. GETTING STARTED WITH FIREWALLD

5.2.1. firewalld

firewalld is a firewall service daemon that provides a dynamic customizable host-based firewall with a **D-Bus** interface. Being dynamic, it enables creating, changing, and deleting the rules without the necessity to restart the firewall daemon each time the rules are changed.

firewalld uses the concepts of *zones* and *services*, that simplify the traffic management. Zones are predefined sets of rules. Network interfaces and sources can be assigned to a zone. The traffic allowed depends on the network your computer is connected to and the security level this network is assigned. Firewall services are predefined rules that cover all necessary settings to allow incoming traffic for a specific service and they apply within a zone.

Services use one or more *ports* or *addresses* for network communication. Firewalls filter communication based on ports. To allow network traffic for a service, its ports must be *open*. **firewalld** blocks all traffic on ports that are not explicitly set as open. Some zones, such as *trusted*, allow all traffic by default.

Additional resources

- **firewalld(1)** man page

5.2.2. Zones

firewalld can be used to separate networks into different zones according to the level of trust that the user has decided to place on the interfaces and traffic within that network. A connection can only be part of one zone, but a zone can be used for many network connections.

NetworkManager notifies **firewalld** of the zone of an interface. You can assign zones to interfaces with:

- **NetworkManager**
- **firewall-config** tool
- **firewall-cmd** command-line tool
- The RHEL web console

The latter three can only edit the appropriate **NetworkManager** configuration files. If you change the zone of the interface using the web console, **firewall-cmd** or **firewall-config**, the request is forwarded to **NetworkManager** and is not handled by **firewalld**.

The predefined zones are stored in the `/usr/lib/firewalld/zones/` directory and can be instantly applied to any available network interface. These files are copied to the `/etc/firewalld/zones/` directory only after they are modified. The default settings of the predefined zones are as follows:

block

Any incoming network connections are rejected with an icmp-host-prohibited message for **IPv4** and icmp6-adm-prohibited for **IPv6**. Only network connections initiated from within the system are possible.

dmz

For computers in your demilitarized zone that are publicly-accessible with limited access to your internal network. Only selected incoming connections are accepted.

drop

Any incoming network packets are dropped without any notification. Only outgoing network connections are possible.

external

For use on external networks with masquerading enabled, especially for routers. You do not trust the other computers on the network to not harm your computer. Only selected incoming connections are accepted.

home

For use at home when you mostly trust the other computers on the network. Only selected incoming connections are accepted.

internal

For use on internal networks when you mostly trust the other computers on the network. Only selected incoming connections are accepted.

public

For use in public areas where you do not trust other computers on the network. Only selected incoming connections are accepted.

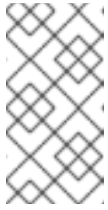
trusted

All network connections are accepted.

work

For use at work where you mostly trust the other computers on the network. Only selected incoming connections are accepted.

One of these zones is set as the *default* zone. When interface connections are added to **NetworkManager**, they are assigned to the default zone. On installation, the default zone in **firewalld** is set to be the **public** zone. The default zone can be changed.



NOTE

The network zone names should be self-explanatory and to allow users to quickly make a reasonable decision. To avoid any security problems, review the default zone configuration and disable any unnecessary services according to your needs and risk assessments.

Additional resources

- **firewalld.zone(5)** man page

5.2.3. Predefined services

A service can be a list of local ports, protocols, source ports, and destinations, as well as a list of firewall helper modules automatically loaded if a service is enabled. Using services saves users time because they can achieve several tasks, such as opening ports, defining protocols, enabling packet forwarding and more, in a single step, rather than setting up everything one after another.

Service configuration options and generic file information are described in the **firewalld.service(5)** man page. The services are specified by means of individual XML configuration files, which are named in the following format: **service-name.xml**. Protocol names are preferred over service or application names in **firewalld**.

Services can be added and removed using the graphical **firewall-config** tool, **firewall-cmd**, and **firewall-offline-cmd**.

Alternatively, you can edit the XML files in the **/etc/firewalld/services/** directory. If a service is not added or changed by the user, then no corresponding XML file is found in **/etc/firewalld/services/**. The files in the **/usr/lib/firewalld/services/** directory can be used as templates if you want to add or change a service.

Additional resources

- **firewalld.service(5)** man page

5.3. INSTALLING THE FIREWALL-CONFIG GUI CONFIGURATION TOOL

To use the **firewall-config** GUI configuration tool, install the **firewall-config** package.

Procedure

1. Enter the following command as **root**:

```
# yum install firewall-config
```

Alternatively, in **GNOME**, use the **Super** key and type **Software** to launch the **Software Sources** application. Type **firewall** to the search box, which appears after selecting the search button in the top-right corner. Select the **Firewall** item from the search results, and click on the **Install** button.

2. To run **firewall-config**, use either the **firewall-config** command or press the **Super** key to enter the **Activities Overview**, type **firewall**, and press **Enter**.

5.4. VIEWING THE CURRENT STATUS AND SETTINGS OF FIREWALLD

5.4.1. Viewing the current status of firewalld

The firewall service, **firewalld**, is installed on the system by default. Use the **firewalld** CLI interface to check that the service is running.

Procedure

1. To see the status of the service:

```
# firewall-cmd --state
```

2. For more information about the service status, use the **systemctl status** sub-command:

```
# systemctl status firewalld
firewalld.service - firewalld - dynamic firewall daemon
  Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor pr
  Active: active (running) since Mon 2017-12-18 16:05:15 CET; 50min ago
    Docs: man:firewalld(1)
   Main PID: 705 (firewalld)
      Tasks: 2 (limit: 4915)
   CGroup: /system.slice/firewalld.service
           └─705 /usr/bin/python3 -Es /usr/sbin/firewalld --nofork --nopid
```

Additional resources

It is important to know how **firewalld** is set up and which rules are in force before you try to edit the settings. To display the firewall settings, see [Section 5.4.2, “Viewing current firewalld settings”](#)

5.4.2. Viewing current firewalld settings

5.4.2.1. Viewing allowed services using GUI

To view the list of services using the graphical **firewall-config** tool, press the **Super** key to enter the Activities Overview, type **firewall**, and press **Enter**. The **firewall-config** tool appears. You can now view the list of services under the **Services** tab.

Alternatively, to start the graphical firewall configuration tool using the command-line, enter the following command:

```
$ firewall-config
```

The **Firewall Configuration** window opens. Note that this command can be run as a normal user, but you are prompted for an administrator password occasionally.

5.4.2.2. Viewing firewalld settings using CLI

With the CLI client, it is possible to get different views of the current firewall settings. The **--list-all** option shows a complete overview of the **firewalld** settings.

firewalld uses zones to manage the traffic. If a zone is not specified by the **--zone** option, the command is effective in the default zone assigned to the active network interface and connection.

To list all the relevant information for the default zone:

```
# firewall-cmd --list-all
public
  target: default
  icmp-block-inversion: no
  interfaces:
  sources:
  services: ssh dhcpv6-client
  ports:
  protocols:
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
```

To specify the zone for which to display the settings, add the **--zone=zone-name** argument to the **firewall-cmd --list-all** command, for example:

```
# firewall-cmd --list-all --zone=home
home
  target: default
  icmp-block-inversion: no
  interfaces:
  sources:
  services: ssh mdns samba-client dhcpv6-client
  ... [trimmed for clarity]
```

To see the settings for particular information, such as services or ports, use a specific option. See the **firewalld** manual pages or get a list of the options using the command help:

```
# firewall-cmd --help

Usage: firewall-cmd [OPTIONS...]

General Options
-h, --help          Prints a short help text and exists
-V, --version       Print the version string of firewalld
-q, --quiet         Do not print status messages

Status Options
--state             Return and print firewalld state
--reload            Reload firewall and keep state information
... [trimmed for clarity]
```

For example, to see which services are allowed in the current zone:

```
# firewall-cmd --list-services
ssh dhcpv6-client
```



NOTE

Listing the settings for a certain subpart using the CLI tool can sometimes be difficult to interpret. For example, you allow the **SSH** service and **firewalld** opens the necessary port (22) for the service. Later, if you list the allowed services, the list shows the **SSH** service, but if you list open ports, it does not show any. Therefore, it is recommended to use the **--list-all** option to make sure you receive a complete information.

5.5. STARTING FIREWALLD

Procedure

1. To start **firewalld**, enter the following command as **root**:

```
# systemctl unmask firewalld
# systemctl start firewalld
```

2. To ensure **firewalld** starts automatically at system start, enter the following command as **root**:

```
# systemctl enable firewalld
```

5.6. STOPPING FIREWALLD

Procedure

1. To stop **firewalld**, enter the following command as **root**:

```
# systemctl stop firewalld
```

2. To prevent **firewalld** from starting automatically at system start:

```
# systemctl disable firewalld
```

3. To make sure **firewalld** is not started by accessing the **firewalld D-Bus** interface and also if other services require **firewalld**:

```
# systemctl mask firewalld
```

5.7. RUNTIME AND PERMANENT SETTINGS

Any changes committed in *runtime* mode only apply while **firewalld** is running. When **firewalld** is restarted, the settings revert to their *permanent* values.

To make the changes persistent across reboots, apply them again using the **--permanent** option. Alternatively, to make changes persistent while **firewalld** is running, use the **--runtime-to-permanent firewall-cmd** option.

If you set the rules while **firewalld** is running using only the **--permanent** option, they do not become effective before **firewalld** is restarted. However, restarting **firewalld** closes all open ports and stops the networking traffic.

Modifying settings in runtime and permanent configuration using CLI

Using the CLI, you do not modify the firewall settings in both modes at the same time. You only modify either runtime or permanent mode. To modify the firewall settings in the permanent mode, use the **--permanent** option with the **firewall-cmd** command.

```
# firewall-cmd --permanent <other options>
```

Without this option, the command modifies runtime mode.

To change settings in both modes, you can use two methods:

1. Change runtime settings and then make them permanent as follows:

```
# firewall-cmd <other options>
# firewall-cmd --runtime-to-permanent
```

2. Set permanent settings and reload the settings into runtime mode:

```
# firewall-cmd --permanent <other options>
# firewall-cmd --reload
```

The first method allows you to test the settings before you apply them to the permanent mode.



NOTE

It is possible, especially on remote systems, that an incorrect setting results in a user locking themselves out of a machine. To prevent such situations, use the **--timeout** option. After a specified amount of time, any change reverts to its previous state. Using this options excludes the **--permanent** option.

For example, to add the **SSH** service for 15 minutes:

```
# firewall-cmd --add-service=ssh --timeout 15m
```

5.8. VERIFYING THE PERMANENT FIREWALLD CONFIGURATION

In certain situations, for example after manually editing **firewalld** configuration files, administrators want to verify that the changes are correct. This section describes how to verify the permanent configuration of the **firewalld** service.

Prerequisites

- The **firewalld** service is running.

Procedure

1. Verify the permanent configuration of the **firewalld** service:

```
# firewall-cmd --check-config
success
```

If the permanent configuration is valid, the command returns **success**. In other cases, the command returns an error with further details, such as the following:

```
■
```

```
# firewall-cmd --check-config
Error: INVALID_PROTOCOL: 'public.xml': 'tcpx' not from {'tcp'|'udp'|'sctp'|'dccp'}
```

5.9. CONTROLLING NETWORK TRAFFIC USING FIREWALLD

5.9.1. Disabling all traffic in case of emergency using CLI

In an emergency situation, such as a system attack, it is possible to disable all network traffic and cut off the attacker.

Procedure

1. To immediately disable networking traffic, switch panic mode on:

```
# firewall-cmd --panic-on
```



IMPORTANT

Enabling panic mode stops all networking traffic. From this reason, it should be used only when you have the physical access to the machine or if you are logged in using a serial console.

Switching off panic mode reverts the firewall to its permanent settings. To switch panic mode off:

```
# firewall-cmd --panic-off
```

To see whether panic mode is switched on or off, use:

```
# firewall-cmd --query-panic
```

5.9.2. Controlling traffic with predefined services using CLI

The most straightforward method to control traffic is to add a predefined service to **firewalld**. This opens all necessary ports and modifies other settings according to the *service definition file*.

Procedure

1. Check that the service is not already allowed:

```
# firewall-cmd --list-services
ssh dhcpv6-client
```

2. List all predefined services:

```
# firewall-cmd --get-services
RH-Satellite-6 amanda-client amanda-k5-client bacula bacula-client bitcoin bitcoin-rpc
bitcoin-testnet bitcoin-testnet-rpc ceph ceph-mon cfengine condor-collector ctdb dhcp dhcpv6
dhcpv6-client dns docker-registry ...
[trimmed for clarity]
```

3. Add the service to the allowed services:


```
# firewall-cmd --add-service=<service-name>
```

4. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5.9.3. Controlling traffic with predefined services using GUI

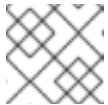
To enable or disable a predefined or custom service:

1. Start the **firewall-config** tool and select the network zone whose services are to be configured.
2. Select the **Services** tab.
3. Select the check box for each type of service you want to trust or clear the check box to block a service.

To edit a service:

1. Start the **firewall-config** tool.
2. Select **Permanent** from the menu labeled **Configuration**. Additional icons and menu buttons appear at the bottom of the **Services** window.
3. Select the service you want to configure.

The **Ports**, **Protocols**, and **Source Port** tabs enable adding, changing, and removing of ports, protocols, and source port for the selected service. The modules tab is for configuring **Netfilter** helper modules. The **Destination** tab enables limiting traffic to a particular destination address and Internet Protocol (**IPv4** or **IPv6**).



NOTE

It is not possible to alter service settings in **Runtime** mode.

5.9.4. Adding new services

Services can be added and removed using the graphical **firewall-config** tool, **firewall-cmd**, and **firewall-offline-cmd**. Alternatively, you can edit the XML files in **/etc/firewalld/services/**. If a service is not added or changed by the user, then no corresponding XML file are found in **/etc/firewalld/services/**. The files **/usr/lib/firewalld/services/** can be used as templates if you want to add or change a service.



NOTE

Service names must be alphanumeric and can, additionally, include only **_** (underscore) and **-** (dash) characters.

Procedure

To add a new service in a terminal, use **firewall-cmd**, or **firewall-offline-cmd** in case of not active **firewalld**.

1. Enter the following command to add a new and empty service:

```
$ firewall-cmd --new-service=service-name --permanent
```

2. To add a new service using a local file, use the following command:

```
$ firewall-cmd --new-service-from-file=service-name.xml --permanent
```

You can change the service name with the additional **--name=*service-name*** option.

3. As soon as service settings are changed, an updated copy of the service is placed into **/etc/firewalld/services/**.

As **root**, you can enter the following command to copy a service manually:

```
# cp /usr/lib/firewalld/services/service-name.xml /etc/firewalld/services/service-name.xml
```

firewalld loads files from **/usr/lib/firewalld/services** in the first place. If files are placed in **/etc/firewalld/services** and they are valid, then these will override the matching files from **/usr/lib/firewalld/services**. The overridden files in **/usr/lib/firewalld/services** are used as soon as the matching files in **/etc/firewalld/services** have been removed or if **firewalld** has been asked to load the defaults of the services. This applies to the permanent environment only. A reload is needed to get these fallbacks also in the runtime environment.

5.9.5. Controlling ports using CLI

Ports are logical devices that enable an operating system to receive and distinguish network traffic and forward it accordingly to system services. These are usually represented by a daemon that listens on the port, that is it waits for any traffic coming to this port.

Normally, system services listen on standard ports that are reserved for them. The **httpd** daemon, for example, listens on port 80. However, system administrators by default configure daemons to listen on different ports to enhance security or for other reasons.

5.9.5.1. Opening a port

Through open ports, the system is accessible from the outside, which represents a security risk. Generally, keep ports closed and only open them if they are required for certain services.

Procedure

To get a list of open ports in the current zone:

1. List all allowed ports:

```
# firewall-cmd --list-ports
```

2. Add a port to the allowed ports to open it for incoming traffic:

```
# firewall-cmd --add-port=port-number/port-type
```

3. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

The port types are either **tcp**, **udp**, **sctp**, or **dccp**. The type must match the type of network communication.

5.9.5.2. Closing a port

When an open port is no longer needed, close that port in **firewalld**. It is highly recommended to close all unnecessary ports as soon as they are not used because leaving a port open represents a security risk.

Procedure

To close a port, remove it from the list of allowed ports:

1. List all allowed ports:

```
# firewall-cmd --list-ports
[WARNING]
====
This command will only give you a list of ports that have been opened as ports. You will not
be able to see any open ports that have been opened as a service. Therefore, you should
consider using the --list-all option instead of --list-ports.
====
```

2. Remove the port from the allowed ports to close it for the incoming traffic:

```
# firewall-cmd --remove-port=port-number/port-type
```

3. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5.9.6. Opening ports using GUI

To permit traffic through the firewall to a certain port:

1. Start the **firewall-config** tool and select the network zone whose settings you want to change.
2. Select the **Ports** tab and click the **Add** button on the right-hand side. The **Port and Protocol** window opens.
3. Enter the port number or range of ports to permit.
4. Select **tcp** or **udp** from the list.

5.9.7. Controlling traffic with protocols using GUI

To permit traffic through the firewall using a certain protocol:

1. Start the **firewall-config** tool and select the network zone whose settings you want to change.
2. Select the **Protocols** tab and click the **Add** button on the right-hand side. The **Protocol** window opens.
3. Either select a protocol from the list or select the **Other Protocol** check box and enter the protocol in the field.

5.9.8. Opening source ports using GUI

To permit traffic through the firewall from a certain port:

1. Start the `firewall-config` tool and select the network zone whose settings you want to change.
2. Select the **Source Port** tab and click the **Add** button on the right-hand side. The **Source Port** window opens.
3. Enter the port number or range of ports to permit. Select **tcp** or **udp** from the list.

5.10. WORKING WITH FIREWALLD ZONES

Zones represent a concept to manage incoming traffic more transparently. The zones are connected to networking interfaces or assigned a range of source addresses. You manage firewall rules for each zone independently, which enables you to define complex firewall settings and apply them to the traffic.

5.10.1. Listing zones

Procedure

1. To see which zones are available on your system:

```
# firewall-cmd --get-zones
```

The **`firewall-cmd --get-zones`** command displays all zones that are available on the system, but it does not show any details for particular zones.

2. To see detailed information for all zones:

```
# firewall-cmd --list-all-zones
```

3. To see detailed information for a specific zone:

```
# firewall-cmd --zone=zone-name --list-all
```

5.10.2. Modifying firewalld settings for a certain zone

The [Section 5.9.2, “Controlling traffic with predefined services using CLI”](#) and [Section 5.9.5, “Controlling ports using CLI”](#) explain how to add services or modify ports in the scope of the current working zone. Sometimes, it is required to set up rules in a different zone.

Procedure

1. To work in a different zone, use the **`--zone=zone-name`** option. For example, to allow the **SSH** service in the zone *public*:

```
# firewall-cmd --add-service=ssh --zone=public
```

5.10.3. Changing the default zone

System administrators assign a zone to a networking interface in its configuration files. If an interface is not assigned to a specific zone, it is assigned to the default zone. After each restart of the **firewalld** service, **firewalld** loads the settings for the default zone and makes it active.

Procedure

To set up the default zone:

1. Display the current default zone:

```
# firewall-cmd --get-default-zone
```

2. Set the new default zone:

```
# firewall-cmd --set-default-zone zone-name
```



NOTE

Following this procedure, the setting is a permanent setting, even without the **--permanent** option.

5.10.4. Assigning a network interface to a zone

It is possible to define different sets of rules for different zones and then change the settings quickly by changing the zone for the interface that is being used. With multiple interfaces, a specific zone can be set for each of them to distinguish traffic that is coming through them.

Procedure

To assign the zone to a specific interface:

1. List the active zones and the interfaces assigned to them:

```
# firewall-cmd --get-active-zones
```

2. Assign the interface to a different zone:

```
# firewall-cmd --zone=zone_name --change-interface=interface_name --permanent
```

5.10.5. Assigning a zone to a connection using nmcli

This procedure describes how to add a firewalld zone to a NetworkManager connection using the **nmcli** utility.

Procedure

1. Assign the zone to the NetworkManager connection profile:

```
# nmcli connection profile modify connection.zone zone_name
```

2. Reload the connection:

```
# nmcli connection up profile
```

5.10.6. Manually assigning a zone to a network connection in an ifcfg file

When the connection is managed by **NetworkManager**, it must be aware of a zone that it uses. For every network connection, a zone can be specified, which provides the flexibility of various firewall settings according to the location of the computer with portable devices. Thus, zones and settings can be specified for different locations, such as company or home.

Procedure

1. To set a zone for a connection, edit the **/etc/sysconfig/network-scripts/ifcfg-connection_name** file and add a line that assigns a zone to this connection:

```
ZONE=zone_name
```

5.10.7. Creating a new zone

To use custom zones, create a new zone and use it just like a predefined zone. New zones require the **--permanent** option, otherwise the command does not work.

Procedure

To create a new zone:

1. Create a new zone:

```
# firewall-cmd --new-zone=zone-name
```

2. Check if the new zone is added to your permanent settings:

```
# firewall-cmd --get-zones
```

3. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5.10.8. Zone configuration files

Zones can also be created using a *zone configuration file*. This approach can be helpful when you need to create a new zone, but want to reuse the settings from a different zone and only alter them a little.

A **firewalld** zone configuration file contains the information for a zone. These are the zone description, services, ports, protocols, icmp-blocks, masquerade, forward-ports and rich language rules in an XML file format. The file name has to be **zone-name.xml** where the length of *zone-name* is currently limited to 17 chars. The zone configuration files are located in the **/usr/lib/firewalld/zones/** and **/etc/firewalld/zones/** directories.

The following example shows a configuration that allows one service (**SSH**) and one port range, for both the **TCP** and **UDP** protocols:

```
<?xml version="1.0" encoding="utf-8"?>
<zone>
  <short>My zone</short>
  <description>Here you can describe the characteristic features of the zone.</description>
  <service name="ssh"/>
```

```
<port port="1025-65535" protocol="tcp"/>
<port port="1025-65535" protocol="udp"/>
</zone>
```

To change settings for that zone, add or remove sections to add ports, forward ports, services, and so on.

Additional resources

- For more information, see the **firewalld.zone** manual pages.

5.10.9. Using zone targets to set default behavior for incoming traffic

For every zone, you can set a default behavior that handles incoming traffic that is not further specified. Such behaviour is defined by setting the target of the zone. There are four options – **default**, **ACCEPT**, **REJECT**, and **DROP**. By setting the target to **ACCEPT**, you accept all incoming packets except those disabled by a specific rule. If you set the target to **REJECT** or **DROP**, you disable all incoming packets except those that you have allowed in specific rules. When packets are rejected, the source machine is informed about the rejection, while there is no information sent when the packets are dropped.

Procedure

To set a target for a zone:

1. List the information for the specific zone to see the default target:

```
$ firewall-cmd --zone=zone-name --list-all
```

2. Set a new target in the zone:

```
# firewall-cmd --permanent --zone=zone-name --set-target=
<default|ACCEPT|REJECT|DROP>
```

5.11. USING ZONES TO MANAGE INCOMING TRAFFIC DEPENDING ON A SOURCE

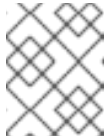
5.11.1. Using zones to manage incoming traffic depending on a source

You can use zones to manage incoming traffic based on its source. That enables you to sort incoming traffic and route it through different zones to allow or disallow services that can be reached by that traffic.

If you add a source to a zone, the zone becomes active and any incoming traffic from that source will be directed through it. You can specify different settings for each zone, which is applied to the traffic from the given sources accordingly. You can use more zones even if you only have one network interface.

5.11.2. Adding a source

To route incoming traffic into a specific source, add the source to that zone. The source can be an IP address or an IP mask in the Classless Inter-domain Routing (CIDR) notation.

**NOTE**

In case you add multiple zones with an overlapping network range, they are ordered alphanumerically by zone name and only the first one is considered.

- To set the source in the current zone:

```
# firewall-cmd --add-source=<source>
```

- To set the source IP address for a specific zone:

```
# firewall-cmd --zone=zone-name --add-source=<source>
```

The following procedure allows all incoming traffic from *192.168.2.15* in the **trusted** zone:

Procedure

1. List all available zones:

```
# firewall-cmd --get-zones
```

2. Add the source IP to the trusted zone in the permanent mode:

```
# firewall-cmd --zone=trusted --add-source=192.168.2.15
```

3. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5.11.3. Removing a source

Removing a source from the zone cuts off the traffic coming from it.

Procedure

1. List allowed sources for the required zone:

```
# firewall-cmd --zone=zone-name --list-sources
```

2. Remove the source from the zone permanently:

```
# firewall-cmd --zone=zone-name --remove-source=<source>
```

3. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5.11.4. Adding a source port

To enable sorting the traffic based on a port of origin, specify a source port using the **--add-source-port** option. You can also combine this with the **--add-source** option to limit the traffic to a certain IP address or IP range.

Procedure

1. To add a source port:

```
# firewall-cmd --zone=zone-name --add-source-port=<port-name>/<tcp|udp|sctp|dccp>
```

5.11.5. Removing a source port

By removing a source port you disable sorting the traffic based on a port of origin.

Procedure

1. To remove a source port:

```
# firewall-cmd --zone=zone-name --remove-source-port=<port-name>/<tcp|udp|sctp|dccp>
```

5.11.6. Using zones and sources to allow a service for only a specific domain

To allow traffic from a specific network to use a service on a machine, use zones and source. The following procedure allows traffic from *192.168.1.0/24* to be able to reach the *HTTP* service while any other traffic is blocked.

Procedure

1. List all available zones:

```
# firewall-cmd --get-zones
block dmz drop external home internal public trusted work
```

2. Add the source to the trusted zone to route the traffic originating from the source through the zone:

```
# firewall-cmd --zone=trusted --add-source=192.168.1.0/24
```

3. Add the *http* service in the trusted zone:

```
# firewall-cmd --zone=trusted --add-service=http
```

4. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5. Check that the trusted zone is active and that the service is allowed in it:

```
# firewall-cmd --zone=trusted --list-all
trusted (active)
target: ACCEPT
```

```
sources: 192.168.1.0/24
services: http
```

5.11.7. Configuring traffic accepted by a zone based on a protocol

You can allow incoming traffic to be accepted by a zone based on a protocol. All traffic using the specified protocol is accepted by a zone, in which you can apply further rules and filtering.

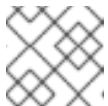
5.11.7.1. Adding a protocol to a zone

By adding a protocol to a certain zone, you allow all traffic with this protocol to be accepted by this zone.

Procedure

1. To add a protocol to a zone:

```
# firewall-cmd --zone=zone-name --add-protocol=port-name/tcp|udp|sctp|dccp|igmp
```



NOTE

To receive multicast traffic, use the **igmp** value with the **--add-protocol** option.

5.11.7.2. Removing a protocol from a zone

By removing a protocol from a certain zone, you stop accepting all traffic based on this protocol by the zone.

Procedure

1. To remove a protocol from a zone:

```
# firewall-cmd --zone=zone-name --remove-protocol=port-name/tcp|udp|sctp|dccp|igmp
```

5.12. CONFIGURING IP ADDRESS MASQUERADING

The following procedure describes how to enable IP masquerading on your system. IP masquerading hides individual machines behind a gateway when accessing the Internet.

Procedure

1. To check if IP masquerading is enabled (for example, for the **external** zone), enter the following command as **root**:

```
# firewall-cmd --zone=external --query-masquerade
```

The command prints **yes** with exit status **0** if enabled. It prints **no** with exit status **1** otherwise. If **zone** is omitted, the default zone will be used.

2. To enable IP masquerading, enter the following command as **root**:

```
# firewall-cmd --zone=external --add-masquerade
```

3. To make this setting persistent, repeat the command adding the **--permanent** option.

To disable IP masquerading, enter the following command as **root**:

```
# firewall-cmd --zone=external --remove-masquerade --permanent
```

5.13. PORT FORWARDING

Redirecting ports using this method only works for IPv4-based traffic. For IPv6 redirecting setup, you must use rich rules.

To redirect to an external system, it is necessary to enable masquerading. For more information, see [Configuring IP address masquerading](#).

5.13.1. Adding a port to redirect

Using **firewall-d**, you can set up ports redirection so that any incoming traffic that reaches a certain port on your system is delivered to another internal port of your choice or to an external port on another machine.

Prerequisites

- Before you redirect traffic from one port to another port, or another address, you have to know three things: which port the packets arrive at, what protocol is used, and where you want to redirect them.

Procedure

To redirect a port to another port:

```
# firewall-cmd --add-forward-port=port=port-number:proto=tcp|udp|sctp|dccp:toport=port-number
```

To redirect a port to another port at a different IP address:

1. Add the port to be forwarded:

```
# firewall-cmd --add-forward-port=port=port-number:proto=tcp|udp:toport=port-number:toaddr=IP
```

2. Enable masquerade:

```
# firewall-cmd --add-masquerade
```

5.13.2. Redirecting TCP port 80 to port 88 on the same machine

Follow the steps to redirect the TCP port 80 to port 88.

Procedure

1. Redirect the port 80 to port 88 for TCP traffic:

```
# firewall-cmd --add-forward-port=port=80:proto=tcp:toport=88
```

2. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

3. Check that the port is redirected:

```
# firewall-cmd --list-all
```

5.13.3. Removing a redirected port

To remove a redirected port:

```
# firewall-cmd --remove-forward-port=port=port-number:proto=<tcp|udp>:toport=port-number:toaddr=<IP>
```

To remove a forwarded port redirected to a different address, use the following procedure.

Procedure

1. Remove the forwarded port:

```
# firewall-cmd --remove-forward-port=port=port-number:proto=<tcp|udp>:toport=port-number:toaddr=<IP>
```

2. Disable masquerade:

```
# firewall-cmd --remove-masquerade
```

5.13.4. Removing TCP port 80 forwarded to port 88 on the same machine

To remove the port redirection:

Procedure

1. List redirected ports:

```
~]# firewall-cmd --list-forward-ports  
port=80:proto=tcp:toport=88:toaddr=
```

2. Remove the redirected port from the firewall::

```
~]# firewall-cmd --remove-forward-port=port=80:proto=tcp:toport=88:toaddr=
```

3. Make the new settings persistent:

```
~]# firewall-cmd --runtime-to-permanent
```

5.14. MANAGING ICMP REQUESTS

The **Internet Control Message Protocol (ICMP)** is a supporting protocol that is used by various network devices to send error messages and operational information indicating a connection problem,

for example, that a requested service is not available. **ICMP** differs from transport protocols such as TCP and UDP because it is not used to exchange data between systems.

Unfortunately, it is possible to use the **ICMP** messages, especially **echo-request** and **echo-reply**, to reveal information about your network and misuse such information for various kinds of fraudulent activities. Therefore, **firewalld** enables blocking the **ICMP** requests to protect your network information.

5.14.1. Listing and blocking ICMP requests

Listing ICMP requests

The **ICMP** requests are described in individual XML files that are located in the `/usr/lib/firewalld/icmptypes/` directory. You can read these files to see a description of the request. The **firewall-cmd** command controls the **ICMP** requests manipulation.

- To list all available **ICMP** types:

```
# firewall-cmd --get-icmptypes
```

- The **ICMP** request can be used by IPv4, IPv6, or by both protocols. To see for which protocol the **ICMP** request is used:

```
# firewall-cmd --info-icmptype=<icmptype>
```

- The status of an **ICMP** request shows **yes** if the request is currently blocked or **no** if it is not. To see if an **ICMP** request is currently blocked:

```
# firewall-cmd --query-icmp-block=<icmptype>
```

Blocking or unblocking ICMP requests

When your server blocks **ICMP** requests, it does not provide the information that it normally would. However, that does not mean that no information is given at all. The clients receive information that the particular **ICMP** request is being blocked (rejected). Blocking the **ICMP** requests should be considered carefully, because it can cause communication problems, especially with IPv6 traffic.

- To see if an **ICMP** request is currently blocked:

```
# firewall-cmd --query-icmp-block=<icmptype>
```

- To block an **ICMP** request:

```
# firewall-cmd --add-icmp-block=<icmptype>
```

- To remove the block for an **ICMP** request:

```
# firewall-cmd --remove-icmp-block=<icmptype>
```

Blocking ICMP requests without providing any information at all

Normally, if you block **ICMP** requests, clients know that you are blocking it. So, a potential attacker who is sniffing for live IP addresses is still able to see that your IP address is online. To hide this information completely, you have to drop all **ICMP** requests.

- To block and drop all **ICMP** requests:

1. Set the target of your zone to **DROP**:

```
# firewall-cmd --permanent --set-target=DROP
```

Now, all traffic, including **ICMP** requests, is dropped, except traffic which you have explicitly allowed.

- To block and drop certain **ICMP** requests and allow others:

1. Set the target of your zone to **DROP**:

```
# firewall-cmd --permanent --set-target=DROP
```

2. Add the ICMP block inversion to block all **ICMP** requests at once:

```
# firewall-cmd --add-icmp-block-inversion
```

3. Add the ICMP block for those **ICMP** requests that you want to allow:

```
# firewall-cmd --add-icmp-block=<icmptype>
```

4. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

The *block inversion* inverts the setting of the **ICMP** requests blocks, so all requests, that were not previously blocked, are blocked because of the target of your zone changes to **DROP**. The requests that were blocked are not blocked. This means that if you want to unblock a request, you must use the blocking command.

- To revert the block inversion to a fully permissive setting:

1. Set the target of your zone to **default** or **ACCEPT**:

```
# firewall-cmd --permanent --set-target=default
```

2. Remove all added blocks for **ICMP** requests:

```
# firewall-cmd --remove-icmp-block=<icmptype>
```

3. Remove the **ICMP** block inversion:

```
# firewall-cmd --remove-icmp-block-inversion
```

4. Make the new settings persistent:

```
# firewall-cmd --runtime-to-permanent
```

5.14.2. Configuring the ICMP filter using GUI

- To enable or disable an **ICMP** filter, start the **firewall-config** tool and select the network zone

whose messages are to be filtered. Select the **ICMP Filter** tab and select the check box for each type of **ICMP** message you want to filter. Clear the check box to disable a filter. This setting is per direction and the default allows everything.

- To edit an **ICMP** type, start the **firewall-config** tool and select **Permanent** mode from the menu labeled **Configuration**. Additional icons appear at the bottom of the **Services** window. Select **Yes** in the following dialog to enable masquerading and to make forwarding to another machine working.
- To enable inverting the **ICMP Filter**, click the **Invert Filter** check box on the right. Only marked **ICMP** types are now accepted, all other are rejected. In a zone using the DROP target, they are dropped.

5.15. SETTING AND CONTROLLING IP SETS USING FIREWALLD

To see the list of IP set types supported by **firewalld**, enter the following command as root.

```
~]# firewall-cmd --get-ipset-types
hash:ip hash:ip,mark hash:ip,port hash:ip,port,ip hash:ip,port,net hash:mac hash:net hash:net,iface
hash:net,net hash:net,port hash:net,port,net
```

5.15.1. Configuring IP set options using CLI

IP sets can be used in **firewalld** zones as sources and also as sources in rich rules. In Red Hat Enterprise Linux, the preferred method is to use the IP sets created with **firewalld** in a direct rule.

- To list the IP sets known to **firewalld** in the permanent environment, use the following command as **root**:

```
# firewall-cmd --permanent --get-ipsets
```

- To add a new IP set, use the following command using the permanent environment as **root**:

```
# firewall-cmd --permanent --new-ipset=test --type=hash:net
success
```

The previous command creates a new IP set with the name *test* and the **hash:net** type for **IPv4**. To create an IP set for use with **IPv6**, add the **--option=family=inet6** option. To make the new setting effective in the runtime environment, reload **firewalld**.

- List the new IP set with the following command as **root**:

```
# firewall-cmd --permanent --get-ipsets
test
```

- To get more information about the IP set, use the following command as **root**:

```
# firewall-cmd --permanent --info-ipset=test
test
type: hash:net
options:
entries:
```

Note that the IP set does not have any entries at the moment.

- To add an entry to the *test* IP set, use the following command as **root**:

```
# firewall-cmd --permanent --ipset=test --add-entry=192.168.0.1
success
```

The previous command adds the IP address *192.168.0.1* to the IP set.

- To get the list of current entries in the IP set, use the following command as **root**:

```
# firewall-cmd --permanent --ipset=test --get-entries
192.168.0.1
```

- Generate a file containing a list of IP addresses, for example:

```
# cat > iplist.txt <<EOL
192.168.0.2
192.168.0.3
192.168.1.0/24
192.168.2.254
EOL
```

The file with the list of IP addresses for an IP set should contain an entry per line. Lines starting with a hash, a semi-colon, or empty lines are ignored.

- To add the addresses from the *iplist.txt* file, use the following command as **root**:

```
# firewall-cmd --permanent --ipset=test --add-entries-from-file=iplist.txt
success
```

- To see the extended entries list of the IP set, use the following command as **root**:

```
# firewall-cmd --permanent --ipset=test --get-entries
192.168.0.1
192.168.0.2
192.168.0.3
192.168.1.0/24
192.168.2.254
```

- To remove the addresses from the IP set and to check the updated entries list, use the following commands as **root**:

```
# firewall-cmd --permanent --ipset=test --remove-entries-from-file=iplist.txt
success
# firewall-cmd --permanent --ipset=test --get-entries
192.168.0.1
```

- You can add the IP set as a source to a zone to handle all traffic coming in from any of the addresses listed in the IP set with a zone. For example, to add the *test* IP set as a source to the *drop* zone to drop all packets coming from all entries listed in the *test* IP set, use the following command as **root**:


```
# firewall-cmd --permanent --zone=drop --add-source=ipset:test
success
```

The **ipset:** prefix in the source shows **firewalld** that the source is an IP set and not an IP address or an address range.

Only the creation and removal of IP sets is limited to the permanent environment, all other IP set options can be used also in the runtime environment without the **--permanent** option.



WARNING

Red Hat does not recommend using IP sets that are not managed through **firewalld**. To use such IP sets, a permanent direct rule is required to reference the set, and a custom service must be added to create these IP sets. This service needs to be started before **firewalld** starts, otherwise **firewalld** is not able to add the direct rules using these sets. You can add permanent direct rules with the **/etc/firewalld/direct.xml** file.

5.16. PRIORITIZING RICH RULES

By default, rich rules are organized based on their rule action. For example, **deny** rules have precedence over **allow** rules. The **priority** parameter in rich rules provides administrators fine-grained control over rich rules and their execution order.

5.16.1. How the priority parameter organizes rules into different chains

You can set the **priority** parameter in a rich rule to any number between **-32768** and **32767**, and lower values have higher precedence.

The **firewalld** service organizes rules based on their priority value into different chains:

- Priority lower than 0: the rule is redirected into a chain with the **_pre** suffix.
- Priority higher than 0: the rule is redirected into a chain with the **_post** suffix.
- Priority equals 0: based on the action, the rule is redirected into a chain with the **_log**, **_deny**, or **_allow** the action.

Inside these sub-chains, **firewalld** sorts the rules based on their priority value.

5.16.2. Setting the priority of a rich rule

The procedure describes an example of how to create a rich rule that uses the **priority** parameter to log all traffic that is not allowed or denied by other rules. You can use this rule to flag unexpected traffic.

Procedure

1. Add a rich rule with a very low precedence to log all traffic that has not been matched by other rules:

```
# firewall-cmd --add-rich-rule='rule priority=32767 log prefix="UNEXPECTED: " limit
value="5/m"'
```

The command additionally limits the number of log entries to **5** per minute.

2. Optionally, display the **nftables** rule that the command in the previous step created:

```
# nft list chain inet firewalld filter_IN_public_post
table inet firewalld {
  chain filter_IN_public_post {
    log prefix "UNEXPECTED: " limit rate 5/minute
  }
}
```

5.17. CONFIGURING FIREWALL LOCKDOWN

Local applications or services are able to change the firewall configuration if they are running as **root** (for example, **libvirt**). With this feature, the administrator can lock the firewall configuration so that either no applications or only applications that are added to the lockdown allow list are able to request firewall changes. The lockdown settings default to disabled. If enabled, the user can be sure that there are no unwanted configuration changes made to the firewall by local applications or services.

5.17.1. Configuring lockdown using CLI

- To query whether lockdown is enabled, use the following command as **root**:

```
# firewall-cmd --query-lockdown
```

The command prints **yes** with exit status **0** if lockdown is enabled. It prints **no** with exit status **1** otherwise.

- To enable lockdown, enter the following command as **root**:

```
# firewall-cmd --lockdown-on
```

- To disable lockdown, use the following command as **root**:

```
# firewall-cmd --lockdown-off
```

5.17.2. Configuring lockdown allow list options using CLI

The lockdown allow list can contain commands, security contexts, users and user IDs. If a command entry on the allow list ends with an asterisk "*", then all command lines starting with that command will match. If the "*" is not there then the absolute command including arguments must match.

- The context is the security (SELinux) context of a running application or service. To get the context of a running application use the following command:

```
$ ps -e --context
```

That command returns all running applications. Pipe the output through the **grep** tool to get the application of interest. For example:

■

- ```
$ ps -e --context | grep example_program
```
- To list all command lines that are on the allow list, enter the following command as **root**:
 

```
firewall-cmd --list-lockdown-whitelist-commands
```
- To add a command *command* to the allow list, enter the following command as **root**:
 

```
firewall-cmd --add-lockdown-whitelist-command='/usr/bin/python3 -Es /usr/bin/command'
```
- To remove a command *command* from the allow list, enter the following command as **root**:
 

```
firewall-cmd --remove-lockdown-whitelist-command='/usr/bin/python3 -Es /usr/bin/command'
```
- To query whether the command *command* is on the allow list, enter the following command as **root**:
 

```
firewall-cmd --query-lockdown-whitelist-command='/usr/bin/python3 -Es /usr/bin/command'
```

The command prints **yes** with exit status **0** if true. It prints **no** with exit status **1** otherwise.
- To list all security contexts that are on the allow list, enter the following command as **root**:
 

```
firewall-cmd --list-lockdown-whitelist-contexts
```
- To add a context *context* to the allow list, enter the following command as **root**:
 

```
firewall-cmd --add-lockdown-whitelist-context=context
```
- To remove a context *context* from the allow list, enter the following command as **root**:
 

```
firewall-cmd --remove-lockdown-whitelist-context=context
```
- To query whether the context *context* is on the allow list, enter the following command as **root**:
 

```
firewall-cmd --query-lockdown-whitelist-context=context
```

Prints **yes** with exit status **0**, if true, prints **no** with exit status **1** otherwise.
- To list all user IDs that are on the allow list, enter the following command as **root**:
 

```
firewall-cmd --list-lockdown-whitelist-uids
```
- To add a user ID *uid* to the allow list, enter the following command as **root**:
 

```
firewall-cmd --add-lockdown-whitelist-uid=uid
```
- To remove a user ID *uid* from the allow list, enter the following command as **root**:
 

```
firewall-cmd --remove-lockdown-whitelist-uid=uid
```

- To query whether the user ID *uid* is on the allow list, enter the following command:

```
$ firewall-cmd --query-lockdown-whitelist-uid=uid
```

Prints **yes** with exit status **0**, if true, prints **no** with exit status **1** otherwise.

- To list all user names that are on the allow list, enter the following command as **root**:

```
firewall-cmd --list-lockdown-whitelist-users
```

- To add a user name *user* to the allow list, enter the following command as **root**:

```
firewall-cmd --add-lockdown-whitelist-user=user
```

- To remove a user name *user* from the allow list, enter the following command as **root**:

```
firewall-cmd --remove-lockdown-whitelist-user=user
```

- To query whether the user name *user* is on the allow list, enter the following command:

```
$ firewall-cmd --query-lockdown-whitelist-user=user
```

Prints **yes** with exit status **0**, if true, prints **no** with exit status **1** otherwise.

### 5.17.3. Configuring lockdown allow list options using configuration files

The default allow list configuration file contains the **NetworkManager** context and the default context of **libvirt**. The user ID 0 is also on the list.

```
<?xml version="1.0" encoding="utf-8"?>
<whitelist>
 <selinux context="system_u:system_r:NetworkManager_t:s0"/>
 <selinux context="system_u:system_r:virttd_t:s0-s0:c0.c1023"/>
 <user id="0"/>
</whitelist>
```

Following is an example allow list configuration file enabling all commands for the **firewall-cmd** utility, for a user called *user* whose user ID is **815**:

```
<?xml version="1.0" encoding="utf-8"?>
<whitelist>
 <command name="/usr/libexec/platform-python -s /bin/firewall-cmd"/*>
 <selinux context="system_u:system_r:NetworkManager_t:s0"/>
 <user id="815"/>
 <user name="user"/>
</whitelist>
```

This example shows both **user id** and **user name**, but only one option is required. Python is the interpreter and is prepended to the command line. You can also use a specific command, for example:

```
/usr/bin/python3 /bin/firewall-cmd --lockdown-on
```

In that example, only the **--lockdown-on** command is allowed.

In Red Hat Enterprise Linux, all utilities are placed in the `/usr/bin/` directory and the `/bin/` directory is sym-linked to the `/usr/bin/` directory. In other words, although the path for **firewall-cmd** when entered as **root** might resolve to `/bin/firewall-cmd`, `/usr/bin/firewall-cmd` can now be used. All new scripts should use the new location. But be aware that if scripts that run as **root** are written to use the `/bin/firewall-cmd` path, then that command path must be added in the allow listed in addition to the `/usr/bin/firewall-cmd` path traditionally used only for non- **root** users.

The `*` at the end of the name attribute of a command means that all commands that start with this string match. If the `*` is not there then the absolute command including arguments must match.

## 5.18. LOG FOR DENIED PACKETS

With the **LogDenied** option in the **firewalld**, it is possible to add a simple logging mechanism for denied packets. These are the packets that are rejected or dropped. To change the setting of the logging, edit the `/etc/firewalld/firewalld.conf` file or use the command-line or GUI configuration tool.

If **LogDenied** is enabled, logging rules are added right before the reject and drop rules in the INPUT, FORWARD and OUTPUT chains for the default rules and also the final reject and drop rules in zones. The possible values for this setting are: **all**, **unicast**, **broadcast**, **multicast**, and **off**. The default setting is **off**. With the **unicast**, **broadcast**, and **multicast** setting, the **pktype** match is used to match the link-layer packet type. With **all**, all packets are logged.

To list the actual **LogDenied** setting with **firewall-cmd**, use the following command as **root**:

```
firewall-cmd --get-log-denied
off
```

To change the **LogDenied** setting, use the following command as **root**:

```
firewall-cmd --set-log-denied=all
success
```

To change the **LogDenied** setting with the **firewalld** GUI configuration tool, start **firewall-config**, click the **Options** menu and select **Change Log Denied**. The **LogDenied** window appears. Select the new **LogDenied** setting from the menu and click OK.

## 5.19. RELATED INFORMATION

The following sources of information provide additional resources regarding **firewalld**.

### Installed documentation

- **firewalld(1)** man page – describes command options for **firewalld**.
- **firewalld.conf(5)** man page – contains information to configure **firewalld**.
- **firewall-cmd(1)** man page – describes command options for the **firewalld** command-line client.
- **firewall-config(1)** man page – describes settings for the **firewall-config** tool.
- **firewall-offline-cmd(1)** man page – describes command options for the **firewalld** offline command-line client.
- **firewalld.icmptype(5)** man page – describes XML configuration files for **ICMP** filtering.

- **firewalld.ipset(5)** man page – describes XML configuration files for the **firewalld IP** sets.
- **firewalld.service(5)** man page – describes XML configuration files for **firewalld service**.
- **firewalld.zone(5)** man page – describes XML configuration files for **firewalld** zone configuration.
- **firewalld.direct(5)** man page – describes the **firewalld** direct interface configuration file.
- **firewalld.lockdown-whitelist(5)** man page – describes the **firewalld** lockdown allow list configuration file.
- **firewalld.richlanguage(5)** man page – describes the **firewalld** rich language rule syntax.
- **firewalld.zones(5)** man page – general description of what zones are and how to configure them.
- **firewalld.dbus(5)** man page – describes the **D-Bus** interface of **firewalld**.

#### Online documentation

- <http://www.firewalld.org/> – **firewalld** home page.